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10/668,029

09/22/2003

Deepa Moorthy

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EXAMINER

MALKOWSKI, KENNETH J

ART UNIT

PAPER NUMBER

2613

SHORTENED STATUTORY PERIOD OF RESPONSE	NOTIFICATION DATE	DELIVERY MODE
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3 MONTHS

04/10/2007

ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

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Office Action Summary

Application No.

10/668,029

Applicant(s)

MOORTHY ET AL.

Examiner

Kenneth J. Malkowski

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 24 January 2007.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☐ Claim(s) _____ is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-10, 12, and 14-31 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 22 September 2003 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Drawings

1. The drawings are objected to under 37 CFR 1.83(a). The drawings must show every feature of the invention specified in the claims. Therefore, the "flat lens having unity transmittance and this is disposed optically upstream of a Fourier lens..." as claimed in claims 5 and 26 must be shown or the feature(s) canceled from the claim(s). No new matter should be entered.

Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Claim Rejections - 35 USC § 103

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2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

3. Claims 1-5, 10, 12, 14-28 and 32-38 are rejected under 35 U.S.C. 103 (a) as being unpatentable over U.S. Patent Application Publication No. 2002/0126644 to Turpin et al. in view of "Carrier-to-Noise Ratio and Sidelobe Level in a Two-Laser Model Optically Controlled Array Antenna Using Fourier Optics," IEEE Transactions on Antennas and propagation, Vol. 40, No. 12, December 1992 to Konishi et al.

With respect to claims 1, 12 and 32 Turpin discloses an apparatus comprising: at least a first and a second electrical signal input ($S_1(t)$, $S_2(t)$, Figure 3) having at least: a first output providing a first optical signal characterized by a first carrier wavelength (page 8 paragraph 99 (detector architecture can be used as a multi-channel correlator))(figure 6), wherein the first optical signal corresponds to a first electrical signal (page 5 paragraph 62 (signal conversion means for converting received signals into a form suitable for the optical correlator))(14, Figure 3 (signal conversion))(page 8 paragraph 100 (output of signal conversion means is a light beam 78 that is intensity modulated)); and a second output providing a second optical signal characterized by a second carrier wavelength that is different than the first carrier wavelength (page 8 paragraph 99 (detector architecture can be used as a multi-channel correlator))(figure 6), wherein the second optical signal corresponds to a second electrical signal ((page 5 paragraph 62 (signal conversion means for converting received signals into a form suitable for the optical correlator))(14, Figure 3 (signal conversion))(page 8 paragraph 100 (output of signal conversion

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means is a light beam 78 that is intensity modulated)); an optical correlator that receives at least the first and second optical signal and that has an output (30, Figure 3 (multi-channel optical correlator)) at least simultaneously comprising (page 4 paragraph 56 (the receiver must simultaneously decode or de-spread information to restore the information to its original bandwidth))(page 7 paragraph 92 (multichannel optical correlation processor simultaneously correlated the received signal with a set of hypothesized waveforms)): a first correlation result optical signal that corresponds to an amount of correlation between the first optical signal and a correlation reference (page 5 paragraph 62 (the optical correlator is provided with an appropriate set of reference hypothesis and one receiver algorithm depending on the exact receiver function to be performed)); and a second correlation result optical signal that corresponds to an amount of correlation between the second optical signal and the correlation reference (page 1 paragraph 6 (data generated by the optical correlator is fed to one or more receiver algorithms which identify, sort and separate the transmissions of various simultaneous users))(page 5 paragraphs 66-67 (correlation is the measurement of similarity of one or more characteristics of two entities, received waveforms and hypothesis create a measured correlation as a function of time offsets)). However, Turpin fails to disclose that the single represented antenna shown in Figure 3 could have separate antennas for each of the incoming signals. Despite this, using multiple antennas as opposed to a single antenna is well known in the art as an adequate optional design alternative. Konishi, from the same field of endeavor discloses an array of antenna elements (Figures 1-2 antenna elements 1-N), which receive RF signals (abstract, page 1459) and each received electrical signal from a given antenna is electro-optic converted into respective wavelength signals. Therefore, it would have been obvious to one of ordinary skill in the art to implement the

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element array and subsequent electro-optic conversion as taught by Konishi in place of the single antenna configuration as disclosed by Turpin. The motivation for going so would have been to improve damage resilience as well as avoiding any peak power restriction due to limited capacity of a single source.

With respect to claim 2, Turpin in view of Konishi discloses the apparatus of claim 1 wherein the optical correlator (30, Figure 3) comprises optical correlator filter means for filtering the first and second optical signals as a function, at least in part, of the correlation reference (page 6 paragraph 74 (when a particular hypothesis matches one of the unique waveforms at one of the time delays, the magnitude is maximized to create an autocorrelation, otherwise a cross-correlation results. In this way filtering takes place where the passed signal is the autocorrelation signal and the filtered signal is the cross-correlated signal))(page 5 paragraphs 66-71 (equations (1-5) shows how received waveforms are filtered as a function of the correlation reference; paragraph 70 states the value in equation 3 is the value of the correlation between the received waveform and the hypothesis at a certain time offset, while paragraph 67 states the correlation is measured as a function of time offsets)).

With respect to claim 3, Turpin in view of Konishi discloses the apparatus of claim 2 wherein the correlation reference comprises a reference signal signature (page 7 paragraph 92 optical correlation processor correlates the received signal with a set of hypothesized waveforms encompassing all probable or known signature waveforms)).

With respect to claim 4, Turpin in view of Konishi discloses the apparatus of claim 3 wherein the reference signal signature comprises a code division multiple access de-spreading

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code (page 4 paragraph 56 (receiver simultaneously decodes or de-spreads the information to restore it to its original bandwidth))(page 3 paragraph 46 (the present invention has particular utility in spread spectrum Code Division Multiple Access systems)).

With respect to claim 5, Turpin in view of Konishi discloses the apparatus of claim 1 and further comprising a flat lens having unity transmittance (124, Figure 14 (beam forming lenses) and that is disposed optically upstream of a Fourier lens disposed between the first and second electrical signal input and the first and second output (126, Figure 14 (integration lenses))(page 11 paragraph 137).

With respect to claim 10, Turpin in view of Konishi discloses the apparatus of claim 1 and further comprising a multiple wavelength photo-detector array (112, Figure 14 (photo diode array))(24, Figure 1 (data recovery)) disposed optically subsequent to the optical correlator (80, Figure 14)(20, Figure 1 (matched filter correlator)).

With respect to claims 14-15, Turpin in view of Konishi discloses the method of claim 12 wherein converting the first and second electrical signals ($S_1(t)$, $S_2(t)$, Figure 3) into corresponding first and second optical signals (page 5 paragraph 62 (signal conversion means for converting received signals into a form suitable for the optical correlator))(14, Figure 3 (signal conversion)) comprises simultaneously converting a plurality of temporally differentiated samples (page 2 paragraph 13 (correlator architecture possesses the quality of using time offsets wherein a time-varying vector represents the results of correlation)) of the first and second electrical signal into a corresponding plurality of temporally differentiated first and second optical signals (page 1 paragraph 6 (the multi-channel optical correlators conduct simultaneous

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processing of the optical signal to simultaneously conduct billions of calculations))(page 5 paragraph 62 (signal conversion means provides inputs to a multi-channel optical correlator where relative time delays are estimated)).

With respect to claim 16, Turpin in view of Konishi discloses the method of claim 15 wherein converting the first electrical signal signals ($S_1(t)$, $S_2(t)$, Figure 3) into a corresponding first optical signal (page 5 paragraph 62 (signal conversion means for converting received signals into a form suitable for the optical correlator))(14, Figure 3 (signal conversion)) and converting the second electrical signal signals ($S_1(t)$, $S_2(t)$, Figure 3) into a corresponding second optical signal (page 5 paragraph 62 (signal conversion means for converting received signals into a form suitable for the optical correlator))(14, Figure 3 (signal conversion)) comprises simultaneously (page 1 paragraph 6 (the multi-channel optical correlators conduct simultaneous processing of the optical signal to simultaneously conduct billions of calculations))(page 5 paragraph 62 (signal conversion means provides inputs to a multi-channel optical correlator where relative time delays are estimated)) passing the plurality of temporally differentiated first optical signals and the plurality of temporally differentiated second optical signals through at least a first Fourier lens to provide a first and second Fourier transformed optical signal (125, imaging lens, Figure 14).

With respect to claim 17, Turpin in view of Konishi discloses the method of claim 16 wherein converting the first electrical signal ($S_1(t)$, $S_2(t)$, Figure 3) into a corresponding first optical signal (page 5 paragraph 62 (signal conversion means for converting received signals into a form suitable for the optical correlator))(14, Figure 3 (signal conversion)) and converting the second electrical signal ($S_1(t)$, $S_2(t)$, Figure 3) into a corresponding second optical signal (page 5

paragraph 62 (signal conversion means for converting received signals into a form suitable for the optical correlator))(14, Figure 3 (signal conversion)) further comprises distorting at least one of the first and second Fourier transformed optical signals to provide at least one distorted Fourier transformed optical signal (124, 126, Figure 14, beam-forming and beam integration lenses)).

With respect to claim 18, Turpin in view of Konishi discloses the method of claim 17 wherein distorting at least one of the first and second Fourier transformed optical signals comprises distorting at least one of the first and second Fourier transformed optical signals to thereby facilitate accurately correlating the optical signal that is distorted to the reference signal (Figure 14 depicts said Fourier transformed signals wherein Fourier distortion that takes place via optical lenses prior to correlation. In this way the distortion imparted inherently facilitates the accurate correlation of said optical signals). The forming lenses, imaging lenses and integration lenses (page 11 paragraph 137) process the main beam 118 (page 11 paragraph 138) such that the output at the photo-detector array (112, figure 14) has a complex value equal to correlation values (90, Figure 14)(page 11 paragraph 139). Furthermore said lens arrangement can be implemented in several different embodiments as taught by Turpin (page 11 paragraph 137).

With respect to claim 19, Turpin in view of Konishi discloses the method of claim 12 wherein simultaneously optically correlating a reference signal (page 5 paragraph 62 (the optical correlator is provided with an appropriate set of reference hypothesis and one receiver algorithm depending on the exact receiver function to be performed)) with each of the first optical signal and the second optical signal (page 4 paragraph 56 (the receiver must simultaneously decode or de-spread information to restore the information to its original bandwidth))(page 7 paragraph 92

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(multichannel optical correlation processor simultaneously correlated the received signal with a set of hypothesized waveforms)) comprises providing a first correlation output signal as a function, at least in part, of how closely the first optical signal correlates to the reference signal and a second correlation output signal as a function, at least in part, of how closely the second optical signal correlates to the reference signal (page 6 paragraph 78 (the output of the correlator is the correlation between each PN sequence and received RF signals))(page 6 paragraph 74 (with multiple signals with multiple time delays correlation is composed of the sum of autocorrelation and sum of all cross-correlations)).

With respect to claim 20, Turpin in view of Konishi discloses the method of claim 19 wherein the reference signal comprises a Fourier (frequency) representation of a time-based signal (page 3 paragraph 30 (Figure 5 shows the multichannel optical correlator illustrating complex correlation at an IF frequency))(page 7 paragraph 89 (multichannel correlator performs complex correlation at an IF frequency))(Figure 5 entitled frequency correlator)(page 6 paragraph 74 (autocorrelation, cross-correlation used wherein each entry has a complex value and the phase measuring the radio-frequency phase difference between the hypothesis and received waveform)).

With respect to claim 21, Turpin in view of Konishi discloses the method of claim 19 and further comprising distorting at least one of the first and second correlation output signals to provide a distorted correlation output signal (124, 126, Figure 14, beam-forming and beam integration lenses)).

With respect to claims 22-23 Turpin in view of Konishi discloses the method of claim 21 and further comprising converting the distorted correlation output signal out of the Fourier domain into a corresponding electrical signal to provide a resultant correlation output signal (112, Figure 14 is a photodiode array which converts the correlations into an electrical signals 90)(page 9 paragraph 112 (correlation output 90 is output from optical to electrical sensing rows))(page 10 paragraph 125 (optical beams exiting optical correlator illuminate an array of photo detectors to produce an electrical output)).

With respect to claims 24 Turpin discloses a code division multiple access page 3 paragraph 46 (the present invention has particular utility in spread spectrum Code Division Multiple Access systems)) radio (page 3 paragraph 47 (receiver accepts signals transmitted through free-space that are assigned a particular radio frequency)) receiver comprising (page 4 paragraph 56 (receiver simultaneously decodes or de-spreads the information to restore it to its original bandwidth))(page 3 paragraph 46 (the present invention has particular utility in spread spectrum Code Division Multiple Access systems)): an antenna (12, Figure 3, an antenna is represented accepting multiple RF signals))(page 6 paragraph 81 (receiving means or antenna are used to receive multi-user transmission signals)); at least a first despreading code (page 4 paragraph 56 (the receiver must simultaneously despread the received signals)); a multiple wavelength optical correlator that is operably coupled to the plurality of antennas and the first spreading code (Figure 3 depicts the optical correlator 30, coupled to the plurality of antennas 12)). However, Turpin fails to disclose that the single represented antenna shown in Figure 3 could have separate antennas for each of the incoming signals. Despite this, using multiple antennas as opposed to a single antenna is well known in the art as an adequate optional design

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alternative. Konishi, from the same field of endeavor discloses an array of antenna elements (Figures 1-2 antenna elements 1-N), which receive RF signals (abstract, page 1459) and each received electrical signal from a given antenna is electro-optic converted into respective wavelength signals. Therefore, it would have been obvious to one of ordinary skill in the art to implement the element array and subsequent electro-optic conversion as taught by Konishi in place of the single antenna configuration as disclosed by Turpin. The motivation for going so would have been to improve damage resilience as well as avoiding any peak power restriction due to limited capacity of a single source.

With respect to claim 25 Turpin in view of Konishi discloses the code division multiple access (page 3 paragraph 46 (the present invention has particular utility in spread spectrum Code Multiple Access systems)) radio receiver of claim 24 wherein the multiple wavelength optical correlator (30, Figure 3 (multi-channel optical correlator)) comprises an emissive multiple wavelength spatial light modulator having an input operably coupled to the plurality of antennas (Figure 3 depicts the optical correlator 30, coupled to the plurality of antennas 12)) and having a plurality of optical output signals, wherein each of the optical output signals has a carrier wavelength that is unique to a given one of the antennas (22, Figure 3 are optical signals wherein each one, for example C1, C2 and CN-1 have wavelengths corresponding to the plurality of received antenna signals S1, S2, and SN-1 depicted with the number 10).

With respect to claim 26 Turpin in view of Konishi discloses the code division multiple access radio (page 3 paragraph 46 (the present invention has particular utility in spread spectrum Code Division Multiple Access systems)) receiver of claim 25 (Figure 3) and further comprising a substantially flat lens having unity transmittance (124, Figure 14 (beam forming lenses) and

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that is disposed optically upstream of a Fourier lens having an optical input disposed to receive the plurality of optical output signals and an output providing corresponding Fourier domain optical output signals 125, Figure 14 (imaging lenses))(page 11 paragraph 137).

With respect to claim 27 Turpin in view of Konishi discloses the code division multiple access (page 3 paragraph 46 (the present invention has particular utility in spread spectrum Code Division Multiple Access systems)) radio receiver (Figure 3) of claim 26 and further comprising a first Fourier distorter having an optical input disposed to receive the Fourier domain optical output signals and an optical output that provides distorted Fourier domain optical output signals (125, Figure 14 (imaging lenses))(page 11 paragraph 137).

With respect to claim 28, Turpin in view of Konishi discloses the code division multiple access (page 3 paragraph 46 (the present invention has particular utility in spread spectrum Code Division Multiple Access systems)) radio receiver (Figure 3) of claim 27 and further comprising an optical correlator filter (80, figure 14) having an optical input disposed to receive the distorted Fourier domain optical output signals (input is received from imaging lenses 125 in Figure 14) and an optical output that provides a correlation result optical output signal for each of the plurality of optical output signals (page 6 paragraph 74 (when a particular hypothesis matches one of the unique waveforms at one of the time delays, the magnitude is maximized to create an autocorrelation, otherwise a cross-correlation results. In this way filtering takes place where the passed signal is the autocorrelation signal and the filtered signal is the cross-correlated signal)).

4. Claims 6-8 and 29-31 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent Application Publication No. 2002/0126644 to Turpin et al. in view of "Carrier-to-

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Noise Ratio and Sidelobe Level in a Two-Laser Model Optically Controlled Array Antenna Using Fourier Optics," IEEE Transactions on Antennas and propagation, Vol. 40, No. 12, December 1992 to Konishi et al. and further in view of U.S. Patent No. 6,529,614 to Chao et al.

With respect to claims 6-8, Turpin in view of Konishi discloses the apparatus of claim 5 and further comprising at least one Fourier distorter [on page 8 paragraph 33 of the specification applicant states a Fourier distorter simply repositions the Fourier transformed optical signals and again physically group the time associated data elements to normalize the optical signal](124, 126 Figure 14) with a pair of Fourier lenses (lens 125, Figure 14) and an optical correlator (80, Figure 14). However, Turpin does not disclose the identical setup as claimed by applicant wherein the Fourier distorter is disposed between the Fourier lens and the correlator and there is also a Fourier distorter disposed optically subsequent to the correlator. Despite this such an optical setup is commonly known in the art and cannot be considered a patentable limitation. Chao, from the same field of endeavor discloses a hybrid optoelectronic optical correlator parallel processing system (columns 1-2 lines 65-67 and 1-3) wherein a Fourier distorter (400, Figure 6) is disposed between the Fourier lens (302, Figure 6 (Fourier lens)) and the correlator (214, Figure 6 (filter slim)) and there is also a Fourier distorter (402, Figure 6) disposed optically subsequent to the correlator (214, Figure 6 (filter slim)). Therefore, it would have been obvious to one of ordinary skill in the art at the time of invention to apply the order of components as disclosed by Chao et al. to the optical correlator as disclosed by Turpin. The motivation for doing so would have been to provide flexible focal length adjustment capability (column 8 lines 15-20), fine-tuning and path length minimization (column 8 lines 33-36). Furthermore, any optical element, including a "Fourier distorter," must inherently be a fixed element or a dynamic

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element. The distortion element as taught by Chao can be continuously adjusted (column 8 lines 29-31).

With respect to claims 29-30, Turpin in view of Konishi discloses the code division multiple access (page 3 paragraph 46 (the present invention has particular utility in spread spectrum Code Division Multiple Access systems)) radio receiver (Figure 3) of claim 28 and further comprising a second Fourier distorter (two imaging lenses 125 are shown in Figure 14). However, the second optical Fourier distorter of Turpin is not explicitly shown after the correlation results. Despite this such an optical setup is commonly known in the art and cannot be considered a patentable limitation. Chao, from the same field of endeavor discloses a hybrid optoelectronic optical correlator parallel processing system (columns 1-2 lines 65-67 and 1-3) wherein a Fourier distorter (400, Figure 6) is disposed between the Fourier lens (302, Figure 6 (Fourier lens)) and the correlator (214, Figure 6 (filter slim)) and there is also a Fourier distorter (402, Figure 6) disposed optically subsequent to the correlator (214, Figure 6 (filter slim)). Therefore, it would have been obvious to one of ordinary skill in the art at the time of invention to apply the order of components as disclosed by Chao et al. to the optical correlator as disclosed by Turpin. The motivation for doing so would have been to provide flexible focal length adjustment capability (column 8 lines 15-20), fine-tuning and path length minimization (column 8 lines 33-36). Furthermore, any optical element, including a "Fourier distorter," must inherently be a fixed element or a dynamic element. The distortion element as taught by Chao can be continuously adjusted (column 8 lines 29-31).

With respect to claim 31, Turpin in view of in view of Konishi and further in view of Chao disclose the code division multiple access (page 3 paragraph 46 (the present invention has

particular utility in spread spectrum Code Division Multiple Access systems)) radio receiver of claim 30 (page 3 paragraph 47 (receiver accepts signals transmitted through free-space that are assigned a particular radio frequency)) and further comprising a multiple wavelength photodetector array having an optical input disposed to receive the restored correlation result optical output signals and an output comprising electrical signals (112, Figure 14 (photo diode array))(24, Figure 1 (data recovery)) that individually correspond to restored correlation result optical output signals for each of the plurality of antennas (C1, C2, CM following the photo diode array in 14 correspond to the received radio frequency signals shown in figure 3, S1, S2, SN)(page 11 paragraph 139 (output of photodetector array produces an IF signal with a complex modulation equal to correlation values)).

5. Claim 9 is rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent Application Publication No. 2002/0126644 to Turpin et al. in view of "Carrier-to-Noise Ratio and Sidelobe Level in a Two-Laser Model Optically Controlled Array Antenna Using Fourier Optics," IEEE Transactions on Antennas and propagation, Vol. 40, No. 12, December 1992 to Konishi et al. and further in view of U.S. Patent No. 6,529,614 to Chao et al. and further in view of U.S. Patent No. 6,570,708 to Bergeron et al.

With respect to claim 9, Turpin in view of Konishi and further in view of Chao disclose the apparatus of claim 8, however, fail to disclose at least one Fourier lens disposed optically subsequent to the at least one Fourier distorter. Bergeron, from the same field of endeavor discloses an image processing apparatus (title) including an optical correlator used as an optical processor (column 3 lines 9-12) wherein the final element prior to the photodetector is a Fourier distorter (30, Figure 1). Therefore, it would have been obvious to one of ordinary skill in the art

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to situate the Fourier lens after optical distortion elements as taught by Burgeron in the optical correlation system as taught by Turpin in view of Chao. The motivation for doing so would have been to return the optical signal to its original condition prior to the entering the initial Fourier lens in order to be in a suitable form for photo-detection (Bergeron: column 5 lines 51-56 (optical processor has a second lens for performing the inverse Fourier transform of a combined image formed within the area defined by the filter plane thereby allowing for electrical output indicative of light intensity distribution at the optical detector array 32)).

Response to Arguments

6. Applicant's arguments with respect to claims 1, 6-9, 12, 24 and 29-31 have been considered but are moot in view of the new ground(s) of rejection. However, regarding claims 5 and 26 there remain relevant issues to the current rejection. With respect to claim 5, applicant states Turpin does not have a flat lens having unity transmittance upstream of a Fourier lens between the electrical input and electrical output. In applicants' specification, applicant states that the flat optical element characterized by unity transmittance disposed optically upstream of a Fourier lens is "well known in the art as is the practice of Fourier-based optics in general." Applicant also states that the purpose of such a setup is to "focus the individual plane waves of the incoming optical signals to a corresponding single point. Turpin teaches in Figure 14 what is clearly recognizable as a Fourier optic setup with beam forming lenses, imaging lenses, and integration lenses. Because in Figure 14 Turpin shows several lenses which combine to focus the individual plane waves entered into the optical setup to a single corresponding point, the optical setup as taught by Turpin is at the very least functionally equivalent to the admittedly well known, non-novel subject matter claimed in claims 5 and 26.

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Conclusion

7. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Kenneth J. Malkowski whose telephone number is (571) 272-5505. The examiner can normally be reached on M-F 8:30-5:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Ken Vanderpuye can be reached on (571) 272-3078. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

KJM 3/21/07


KENNETH VANDERPUYE
SUPERVISORY PATENT EXAMINER